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OPPORTUNITIES FOR THE PRACTICAL USE OF SPACE  
TECHNOLOGY BY BUSINESSMEN

by

Dr. Charles N. Kimball, President  
MIDWEST RESEARCH INSTITUTE

This is the 10th in a series of meetings that Midwest Research is holding in the Midwest under contract with NASA to tell businessmen about specific economic benefits that can come to their companies - and to this area - from the national space program. These take the form of new products, new processes, new materials, new ideas. In the course of these sessions, which we have held in Omaha, Des Moines, Kansas City, Tulsa, Oklahoma City, and Joplin, we have talked to over 1,500 people, and as a result about 300 different companies in this part of the country are now benefiting from this program. We have visited in depth with people in 187 of these companies in their own plants. Some of their case histories will be of considerable interest to you.

This is going to be a busy, intensive two-hour session here today which we hope will start a close relationship with each of you as individuals. It will continue to be as close as you wish for some time ahead. From this meeting and our subsequent contacts, you should learn much that can expand your product line, improve the processes in your plant, make available to you new techniques and new materials. Our experience in other cities suggests that there is not a man in this room whose business cannot profit from what he learns today, and in subsequent sessions with our men. I would urge you to look at the examples you hear today, in the light of your own business, to see how they could benefit you.

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The men who are with me today from MRI have spent about 100 man-days at various NASA centers throughout the country, and have been briefed by NASA scientists and engineers to the point where they are as knowledgeable a group about this subject as there is in the country.

As you well know, NASA is the National Aeronautics and Space Administration, set up by an Act of Congress in 1958 to consolidate the nation's efforts in space for scientific and peaceful purposes, as contrasted to military purposes. It has a tremendous mission unequaled in history.

James E. Webb, Administrator of NASA, speaking recently about the space program, said, "We have begun the greatest scientific endeavor in the history of the world--the manned exploration of space. The moon venture necessarily takes the spotlight, but it is only one of hundreds of activities that NASA will undertake in the decade to come. The endeavor will require the united efforts of NASA, of thousands of scientists, of thousands of business firms, contractors associated with us, and of the entire nation."

This tremendously challenging new scientific effort now has a budget of \$3.7 billion which will reach \$5 billion next year; NASA's total expenditures in this decade will be in the order of \$50 billion, and by 1970 the aerospace industry will account for more than 5 per cent of our Gross National Product. Incidentally, 92 cents of each NASA dollar is spent in industry, universities, and research organizations.

This space program has as one of its many stated objectives to send a man on a safe round trip to the moon, with all that this means to our stature

among nations and to our international prestige. But to consider the moon trip as NASA's only objective would be as short-sighted as saying that the exploration of the western part of this country was undertaken to permit the explorers to see the Rocky Mountains or to take a swim in the Pacific Ocean. Interplanetary travel would not justify the enormous manpower effort or the billions to be expended, on this basis alone. Instead and in addition, NASA's scientific findings (and its principal output is knowledge) will release a flood of new ideas, new concepts, beyond anything in the history of man.

Space flight forces us to meet strange new environmental conditions, like very high vacuums, cosmic rays, ionized gases, tremendous acceleration forces, high temperatures, low temperatures.

What is actually happening is that because of the space effort, scientists are compressing into one ten-year period--1960 to 1970--an intensified research program that would normally take 50 years. And this ten-year period may be known in the history of science as the decade of research on materials.

This scientific research has resulted in lighter materials, the increasing use of chemicals for applications heretofore considered impossible, new electronics systems, new coatings and materials to meet both very high and very low temperature conditions.

Today's businessman needs to know much more about these new materials than his father knew about steel. The executive whose understanding of materials is limited to the difference between a metal and a plastic may find his competitor passing him by. Moreover, since the space program involves much more

than science, it is essential that the businessmen, bankers, and public officials have an understanding of what these things mean.

We are all aware of many of this nation's splendid achievements in space: the TIROS weather satellites which are creating a new era in weather forecasting; Echo, the inflatable communications balloon satellites, and more recently Telstar, the AT&T financed satellite; the orbiting solar observatory and literally dozens of other scientific satellites and probes; and of course the orbital flights of the manned flight program.

The nation already is receiving enormous benefits from this space effort. They exceed anything ever before obtained from a single undertaking.

But in addition to these more spectacular accomplishments, there are emerging now hundreds of additional, but lesser known, benefits of our gigantic space effort that are being placed in daily use, proving time and again that research pays off in products little dreamed of at the beginning of the effort.

One of the most significant aspects of the space program is that it spreads across the entire industrial spectrum--electronics, metals, plastics, fabrication technology, ceramics, machinery, instruments, controls, textiles, heat transfer, data handling, and hundreds of other areas which could play an important part in the growth of your company.

The Space Act which established NASA in October, 1958, charges this agency with the responsibility of securing the most effective use of the scientific and engineering resources of the country, and also to provide for the widest practical dissemination of information about the benefits to be gained from the use of space activities for peaceful and scientific purposes.

NASA's output is knowledge--an enormous amount. Virtually its entire expenditure is in support of R & D.

How are we going to take advantage of all this knowledge out here, when you consider that despite all the national activity, the Middlewest is relatively inactive?

With only a few exceptions-- some of them really notable-- industry in this region is inadequately involved in the space effort. While a very few firms are making an appreciable contribution to space programs, it is tremendously important to realize that the region is not benefiting technologically or economically from the space age for the most part. Many of our industries have good technical capabilities, yet they are relatively unaware of the many findings which come from NASA that could be profitably employed in their own businesses. This is one of the reasons that our six-state region is falling behind in science-based industry and in keeping our good people at home.

Dr. Frederick E. Terman, the Provost of Stanford University, said that the basic problem of the Middlewest is what academic people call "anti-intellectualism." Speaking in Chicago last year, he said that the Midwest is more interested in the man with a lot of practical know-how than in the man whose strength is depth of training in advanced knowledge. Not enough of the Midwest companies and their leaders know how to make effective use of the "egghead" type. As a result the Midwest companies don't really fight for the men with master's and doctor's degrees being produced by their own universities, let alone by universities in other parts of the country....Under these circumstances is it any wonder that

many of the brightest boys graduating from Midwest schools.....are recruited by West Coast colleges and industries.

The program MRI has with NASA has two major parts. The first involves a study in depth of the 15 leading universities in these six states. We have completed this program, visiting each campus, analyzing the school's capabilities and shortcomings, bringing to the attention of its management the need for more graduate education and research in space related sciences. A number of grants have resulted from our efforts here. At the present rate of growth of graduate education and research in the United States, taking all universities into account, the space effort alone will be 75 per cent short of meeting its manpower requirements by 1970. We cannot leave the solution to this problem in the hands of the schools on both coasts. NASA is looking to our regional universities for intensified effort. It is ready to respond with financial aid to these schools where practical and applicable.

These comments of mine so far are largely for background. Now let's get into the main purpose of this meeting.

NASA has given MRI the job of speeding up the flow of technical advances from the space program to the industry in this and five other Midwestern states. This assignment goes far deeper than merely keeping industry academically informed on what is going on in space. Its basic purpose is to communicate the new knowledge so that industry can use it for its own advantage to improve present manufacturing techniques or develop new products and markets, not to get you NASA contracts. We call this project ASTRA.

The project will, in turn, strengthen the total economic capability of this part of the country by adding a new dimension to our present economy, a dimension based on the science and research which is the key to future growth, both of the firms doing business here and of the economy of the region.

This ASTRA program, the one we will present to you in detail here today, will translate many of NASA's scientific findings into a form which can be of direct benefit to the industries in this part of the country. This task is unequaled in history. Because it embraces so many scientific disciplines, and because of the vastness of the sums being expended, NASA feels that any haphazard, evolutionary process of taking government-developed technical knowledge and passing it on to the general economy would not be adequate to attain the objective. Hence, a planned, organized, continuing effort is involved here.

The ASTRA program has been under way at MRI since November, 1961. During that period, many of our senior people at the Institute have been studying NASA's findings, discoveries, experiments, ~~int~~entions, patents. I would like to tell you about a few of the cases we have already uncovered in which space technology is already benefiting industry. These are examples of ideas which other firms have taken and used for their own purposes.

One of the country's major designers of industrial cooling towers is located in Kansas City. As a result of attending our Kansas City ASTRA meeting, they are now pursuing with NASA the matter of licensing a technique of cleaning cooling towers chemically.

Another Kansas City company saw our demonstration of air bearings and they perceived its application for isolating precision micro-balances used in germanium semiconductor production--that is, isolation against vibration. They borrowed our demonstration unit to test the idea. It worked so well that they have prepared their own specifications and have asked the Marshall Space Laboratories in Huntsville to make some practical units for them.

One of the country's largest oil well equipment companies has a considerable interest in substantially improving reliability through better methods of soldering. We obtained for them copies of the NASA soldering manual for use in their critical production techniques. Additionally, they sent a man to Huntsville, Alabama, for the intensive one-week course in reliable soldering which the Marshall Space Flight Center runs for its people. They wrote us that the information "has benefited us to the extent of practically eliminating our trouble with soldered electrical connections."

An Omaha company is now using a beryllia oxide mold in place of aluminum metal for its resistor housings, at a great savings in man hours. This was a development we saw at one of the NASA centers which we suggested to the Omaha company at a visit to its plant.

You will see slides of life rafts made at the Manned Spacecraft Center at Houston. Several swimming pool manufacturers are vitally interested in this new product to extend their own product lines.

One of our meetings was attended by people from a relatively small outfit in Des Moines which manufactures air conditioning equipment and furnaces.

We disclosed to them material known as refractory back-up tape, which we saw in use at the Marshall Space Center at Huntsville. This could cut their welding costs by 50 per cent.

An Omaha producer of miniature precision wire wound resistors was suffering 20 to 25 per cent breakage of steatite rods in pressing on the end caps. With the help of NASA's Lewis Center, MRI suggested several stronger ceramics. They have now adopted a 95 per cent alumina ceramic rod and say that "breakage has ceased to be a problem."

A company in Kansas City wanted to make 20 foot diameter dished tank heads. The company had okayed the construction of a \$4-million facility to make the heads by conventional means. MRI furnished a NASA report describing the production of 160 in. dished heads by explosive forming and put them in touch with the two men at Marshall who directed this work. The company is now enthusiastically planning toward making these heads by explosive forming, since their preliminary estimates show that this will save \$1-1/2 to \$2 million over the proposed method.

These are examples of economic fallout from the space program. And there are only a few that we have time to disclose today.

Other MRI people on the program will tell you about additional ideas and about the ways in which we can make them available to you.

I might say that none of this fallout is automatic. Irrespective of the quality of the idea we present, it requires an aggressive, intelligent attitude on the part of the firm which will ultimately benefit.

These meetings throughout the six states serve only the purpose of introducing the whole program to you. As you wish more information, we can arrange to meet with you as individuals and spend considerable time. We will know a lot of the answers. When we do not, we will know who to put you in touch with.

We are in continuous touch with the NASA centers and each month we develop new insights and new information. The men we have selected for this ASTRA project were not chosen just because of their technical knowledge and competence, which in itself is considerable, but because of their demonstrated ability to communicate technical information to you in language that is useful to you.

Let me repeat, these meetings are only the beginning of our effort. ASTRA is an action program. It is not concerned with science for science's sake, nor the philosophy of the space effort. It is concerned with digging out from the vast NASA effort information which people can use in their own business, in their own behalf.

To sum up: The over-all economy will feel marked effects from the space program. New techniques will bring higher productivity for both labor and capital. Corporate profit margins should rise. The appearance of new products as a by-product of space research will stimulate demand, create new markets, create a need for more capital. New products, new ideas, new techniques of production will flow out of the space effort. It is our job at MRI, through project ASTRA, to see how to get this done for our states here.

Science is here to stay. More than half of our annual increase in Gross National Product is due to technological improvement and to upgrading of personal skills, less than half being explained by increases in the supply of capital and labor. And it is essential, therefore, that this Middle Western area build an awareness of the economic value of science. This must be demonstrated to many citizens, and particularly to the leaders of this state. The area must build and intelligently promote its reputation for scientific accomplishments and understanding.

Let's not forget that the atomic age passed this area by, with one or two exceptions. We cannot expect another opportunity like space technology in our lifetimes. We had better make use of this now or remain for generations as a non-industrial area.